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ABSTRACT

This research report investigates the need for improved automobile design and safety equipment, what the manufacturers have done about automobile safety, and what could be done. Data were collected from the three major American automobile manufacturers, from federal regulatory agencies, and from insurance companies and others interested in auto safety. It was found that although it is more cost effective to work on the car than on the human being, American automobile manufacturers have traditionally promoted driver behavior modification and road improvement rather than any design improvements for safety and reliability. It was concluded that the auto manufacturers will not voluntarily develop a safe car. Their only consideration is profit, regardless of safety, and this attitude will not change except by mandatory requirement. (MF)

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COST VS. CARNAGE IN AUTOMOBILE DESIGN

by

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A research report submitted in partial fulfillment
of the requirements for the degree
of
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in
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INTRODUCTION

The American automobile industry is in the throes of extreme change because of pressure from the U. S. Government. The reasons which forced the government to require such changes may be known only to a few senators and representatives, but one thing is clear: the lack of development of safety measures in American automobiles is a major shortcoming.

More people are lost each year on our nation's highways than have been lost to us in all the years of war in Viet Nam. Collectively since the inception of motorized transportation more than 1.5 million people have been killed in this country in automobile accidents, specifically, more than 56,000 people were killed and 4,500,000 were injured in 1970 alone.

It could be within the reach of every person who can afford an automobile to purchase safety if the automobile industry would offer it. Unfortunately, adequate safety is not offered by the automobile manufacturers, partly because of pressures for cost reduction in the market place that influence design of the automobile. There seems to be some problem or consideration which is of higher priority than safety; otherwise the manufacturers would have offered greater safety to the public by this

time, and the government would not have had to force them into action.

Problem Statement

The need for automobile passenger safety in a collision has developed much faster than the United States automobile manufacturers have offered effective automotive safety devices to the public, and the added cost of safety equipment for an automobile has been judged to be a negative influence on sales.

Objectives

The specific objectives of this study were as follows:

1. To review literature pertinent to this topic.
2. To write letters to the manufacturers concerned, federal government agencies that regulate automobile safety, Ralph Nader, Dr. William Haddon, Consumer Reports, Allstate Insurance Company, and Insurance Institute of America.
3. To analyze this investigation and draw conclusions by comparing some safety equipment presently in use with that which could be used.

Limitations

Since most people drive or are involved with automobiles made by Ford, Chrysler, General Motors, and American Motors companies, this research paper has been concerned with these automobiles only, and it has not

considered infant and elderly people's safety.

PROCEDURE

Federal government agencies that regulate and influence the mechanical safety of automobiles were asked to contribute any developmental history in the field of safety which they have influenced.

Letters were sent to the manufacturers requesting any information pertinent to the subject. Data with regard to material concerning their contribution to the history and development of automobile safety was requested.

An individual who has been extremely influential in effecting recent development of automotive safety, Ralph Nader, was asked to contribute any findings which pertain to the problem.

The analysis of this study was undertaken and conclusions were reached by a comparison of current safety equipment with that which could have been used. Tables were used to show the progress that has been made and to indicate what could be done.

FINDINGS

Traditionally Detroit has tried to push the idea that in order to reduce the death rate on the nation's highways, the driver's behavior must be modified and the road conditions must be improved. This has been tremen-

dously expensive for the government to conduct driver education classes all over the country and to build vast interstate systems. The federal government supplies $70 - $100 million a year in matching with the states for highway safety programs in 16 specific areas. "...in terms of return for the money, it is more cost effective to work on the car than the human being. Less bang for the buck, as it were." (Motor Trend, 1971:33).

Safety's Status

Particularly within the last decade influential American statesmen have realized that to improve the vehicle might be a more fruitful step, rather than to approach the monumental task of changing driver behavior. Of course, this would mean fierce objections from Detroit, as it would not appreciate regulations on its motor cars like those regulations that have seemed quite appropriate on planes, trains, busses, trucks, and ships for many decades (O'Connell, 1966:222).

Opposition by Physicians. The drive to persuade Detroit to blunt the blow of its cars started long ago. As early as 1934 a physician named Dr. Clair Straith of Detroit had,

> numerous conferences with the automobile makers, begging them to design and construct the car interior so as to inflict as little injury as possible upon the occupants should crasn occur. Many engineers in the industry recognized the truth of Straith's

> suggestions, and management chose to follow the recommendations of the sales-psychologists (O'Connell, 1966:26).

These early attempts were doomed to failure, as Detroit is such a formidable obstacle and its will usually goes unabated. The forces for change were not organized, and private individuals just are not powerful enough. The ranks of the discontent continued to grow, however, and in 1948 Dr. Fletcher D. Woodward, chairman of the section of laryngology, otology and rhinology of the American Medical Association, described,

> the specific injury-producing features of the car interior and made detailed suggestions for their correction. These were ignored, and even ridiculed, by the motorcar industry (O'Connell, 1966:26).

As far back as 1923 Detroit's policies were made clear to the A.M.A., as that association felt that the conditions in the cities were reaching a point beyond which accumulations of exhaust gasses could not be allowed to get worse. However, they observed that the secretary of one of the larger auto manufacturers remarked, "We are in business to make and sell cars. We will conform to any requirement regarding health hazards only when the public demands it and the laws enforce it." (Consumer Reports, 1970:283).

The Wall Street Journal confers that this policy was still prevalent in the middle 1960's, even though they are a business oriented newspaper. They stated that the automobile manufacturers will not do a thing about safety unless and until they are forced to (O'Connell, 1966:265).

Opposition by Government. Courageous men in Congress, like Representative Roberts, sponsored a bill in 1958 which took until 1966 to be passed by Congress that required all federal motor vehicles to be equipped with certain basic safety options. Also, Senators Speno and Robert Kennedy helped initiate the drive to force Detroit to do what it would not do (or could not) voluntarily--build a safe car. This was ultimately forced upon Detroit by the establishment of the 1966 Automobile Safety Act. This established the National Highway Safety Bureau which has since been elevated to the status of an administration (O'Connell, 1966:209).

To indicate the type of opposition which these senators faced, the experiences that Senator Speno encountered were exemplary. The president of a rubber company (whose objectives are closely related to the auto companies') called Senator Speno after he had introduced legislation which would have limited unsafe tire manufacturing. The tire man queried,

> 'You're not serious about this legislation, Senator?' The executive went on to offer to pay the expenses of Speno's next election campaign, as well as kick in for national public relations expenses for Speno. Speno, of course, turned him down cold. He has related this incident publicly many times, in a speech before the American Trial Lawyers Association, for example (O'Connell, 1966: 202).

Things got worse for the legislators, as indicated by his later statement. "The real lobbying battle was

on. The automobile and tire industries had high-pressure lobbies there in the capitol, visiting everybody." (O'Connell, 1966:223).

The bill was passed finally, over Detroit and Akron's objections, and its results have been many fold.

> The 1966 Act has had an important effect on auto safety. It has resulted in the adoption by all manufacturers of safety features that they would otherwise have neglected or offered only as optional equipment (Consumer Reports, 1970:234).

The meager requirements that were established for vehicles purchased by the government were as follows:

1. Anchorages for seat belt assemblies....
2. Padded instrument panel and visors....
3. Recessed instrument panel, instruments and control devices....
4. Impact absorbing steering wheel and column displacement....
5. Safety door latches and hinges....
6. Anchorage of seats....
7. Four-way flasher....(that simultaneously flashes tail and parking lights when car moves onto a road shoulder.)
8. Safety glazing materials (for windows)....
9. Dual operation of brake system....
10. Standard bumper heights....
11. Standard gear quadrant (P R N D L) for automotive vehicles equipped with automatic transmissions.
12. Windshield wipers and washers....
13. Glare-reduction surfaces....
14. Exhaust emission control system....
15. Tires and safety rims....
16. Back-up lights....
17. Outside rear-view mirror(s).... (O'Connell, 1966: 218).

The typical Detroit response to requests for safety by the National Highway Traffic Safety Administration (N.H.T.S.A.) was summarized by Consumer Reports in one of their periodic articles on industry's point of view:

> ...the four U.S. auto manufacturers, acting individually or through the voice of the Automobile Manufacturers Association, or both, respond as if by reflex: There is no proof that the proposed standard is needed or will serve any purpose, they say.

Furthermore, the terms and requirements are not only unclear, says Detroit, but also, cannot possibly be met because of design and production changes. Also, sufficient research and study of the proposal aannot be completed by the deadline, the manufacturers contend (Consumer Reports, 1969:183).

Of course, the automobile manufacturers have not quit trying to get their way. As late as August of 1970, when Henry Ford II was unveiling the 1971 line, he said:

> We have no quarrel with most of the ...safety standards now in force and we expect to meet increasingly demanding standards in the future. At present, however, the auto companies are being pressed into courts, by legislatures, by administrative agencies and by freelance critics to make more progresssin these areas more quickly than is possible (U.S. News, 1970:35).

William Luneburg, president of American Motors, states his company's position a little more bluntly by saying that every problem in Detroit cannot be solved on schedule simply by "giving Detroit a lick in the pants and telling them to use more men and spend more money." (Changing Times, 1970: 32).

However, a Ford spokesman admitted recently that the manufacturers have been dragging their feet in some instances. This is a self admitted policy on the part of the

automobile manufacturers. They are not interested in public awareness or development of safety, especially since it would involve additional capital outlays for the companies involved, and if they can continue with business as usual they would rather do that.

Ralph Nader is one of the only individuals who has written a book concerning design for passenger safety in automobiles, and according to him,

> Automakers have known how to make cars safer for a long time, with energy absorbing bumpers, etc. Dealers have even told me so. I've asked Henry Ford II to look at some of his father's old designs for inspiration (Nader, 1965:57).

Opposition by Insurance Companies. The above statement is graphically illustrated by the Allstate Insurance Company's current T.V. statement showing a tin lizzie hitting a barrier at walking speed (5 mph) with little damage. This is then contrasted in the film with a new car hitting the same barrier at the same speed and incurring hundreds of dollars of damage.

This phenomenon has been well documented by Dr. William Haddon, president of the Insurance Institute, and has been presented twice to the Congress. They used barbier collisions to determine the crashworthiness of automobiles manufactured in Motor City. The barrier test design consisted of simply rolling a car down a specified incline and letting it collide with a concrete barrier. At 5 mph they discovered that the automobiles would incur

$200 to $400 damage in this ordinary parking-lot-type collision. At 10 mph the least amount of damage ($250) was done by a Plymouth Satellite. The maximum amount of damage was incurred by a Pontiac G.T.O. with its highly advertised plastic bumper. The bumper was so strong it pushed the body panels back into the passsenger compartment and cracked the windshield, causing a grand total of $880 worth of damage. This underscores the prevalent policy in Detroit which amounts to advertising gimmicks like the plastic bumper that may actually be less protective to the automobile. According to the Insurance Institute, this is excessive and needless damage, and they hope the public is getting tired of "egg-shell exteriors" that break so easily (Haddon, 1971:25).

Objections to Safety

Of course, for the Federal Safety Administration to establish stronger regulations and force Detroit to eliminate the "egg-shell exteriors" requires some public support. This support was not evident in '66 when the "property damage" section of the safety bill was lobbied out by Detroit. This was explained by a Washington observer who could see why the bill would pass the House and bog down in the Senate: "Basically, it was a matter of lobbying. There are only one hundred senators, and the auto boys are very effective. They have about thirty people working on the Hill." (O'Connell, 1966:217).

Negligence. The same type of willfull irresponsibility was expressed concerning recall campaigns.

> General Motors defeated an attempt in early 1970 to amend the Act to empower the Secretary (of Transportation) to require manufacturers to initiate recall campaigns, and to assume their costs, including the cost of safe replacement parts (Nader, Dodge, and Hotchkiss, 1971:115).

This type of opposition causes weak standards to be issued by the Federal Safety Administration. The pressure from Detroit is still in evidence today as indicated by Dr. Haddon's recent comments:

> The federal rear-end barrier standard will not, even more than two years from now, protect the public's pocket from continuing to be picked by delicate cosmetic design and the resultant forced replacement parts purchases. The public should be warned that the rear-end low-speed crash damageability problem has not been effectively mitigated by the Department of Transportation's standard effective for 1973 model cars--although it perhaps has been swept under the rug--because the standard represents no real advance over current and past cars... (Haddon, 1971:25).

This type of situation draws timely comment from such astute sources as Dr. J. Douglas Brown, dean of the faculty at Princeton University: "...if engineers can design space ships to go to the moon, why can't they design a safer automobile?" (Nader, 1965:209).

The trend does not seem to be improving as indicated by a recent example of procrastination on Detroit's part. This was illustrated on a recent C.B.S. newscast. By August of this year they said Detroit was to be required to build cars that would sustain a 5 mph barrier collision

without any damage. All the automakers have asked for and got an extension to the deadline. Only one manufacturer produced a car that will sustain a crash at that moderate speed--Buick.

Further indication of the lack of progress that Detroit has made can be seen in the fact that the 1970 cars are cheaper to repair than the 1971 cars. This is quite a lucrative practice for the Motor City because whenever a collision occurs, the parts that Detroit supplies yield greater income for the manufacturer when the car is repaired (Haddon, 1971:4).

This trend is even getting worse, as indicated by Dr. Haddon:

> To the increased delicateness designed and built into the cars we have tested--a delicateness which has the potential for generating even larger crash parts sales (for Detroit) than did the tested 1970 models (Haddon, 1971:4).

In the recent past a more courageous news media has been quietly aiding the discontent.

> In the past, Detroit has been criticized for its lethargic response to consumer demands, and its great strides in auto safety over the past five years would have been less so without Washington's pressure (Business Week, 1971:74).

Competitive Disadvantage. They will in fact, do only what they are forced to even today, as indicated by their taking advantage of the National Highway Traffic Safety Administration's (N.H.T.S.A.) standard #101. This standard is relatively loose because of a lack of authority of

the N.H.T.S.A., but it is stated so that shoulder harnesses could restrict all but the upper 5 percentile of people. The result is that when many smaller individuals bother to use their shoulder harnesses they cannot reach some of the major controls of the automobile. Consequently, the drivers of the automobiles may not use their shoulder harnesses because of the fact that they cannot reach some of the major controls. Other examples of progress being made only after federal safety regulations are in effect: (1) head restraints on front outboard seats, (2) shoulder harnesses, (3) break-away steering columns, (4) safety glass that does not break until impacted at over 12 mph (The government has recently raised the standard to 24 mph, and (5) rear seat belts (Consumer Reports, 1970:236).

Business Week feels that "The automakers' attitude has always been that the cause of most accidents is 'the nut behind the wheel', not the hardware in his hands." Even the director of the N.H.T.S.A., Douglas Toms, agrees with the manufacturers that the driver is usually at partial fault in most accidents. "But he says, 'I don't think that just because a person makes a mistake he ought to die for it.'" Even so, it has been an uphill battle to get the manufacturers to include meaningful safety devices in their vehicles (Business Week, 1971:80).

Many groups have initiated pressure for change in automobile design regarding safety. "They have one thing

in common: They worry about people, and they put people ahead of dollars." (O'Connell, 1966:22).

The news release by the Physicians for Automotive Safety (P.A.S.) reflected in 1965 the opinion that a branch of the American Association for Automotive Medicine felt that in order to accomplish reforms toward a safer car requires public support. Furthermore, most Americans do not recognize the injury potential of the automobile. WWe must lay to rest forever the words, 'Safety does not sell' and 'Safety is expensive.' Human lives are at stake, not balance sheets." (O'Connell, 1966:25).

Detroit has tried to squelch many of the advocates of safety by saying that they were unknowledgable or "amateur experts." One individual appeared whom they could not idly dismiss. Henry H. Wakeland, who is now head of safety development in New York state, was an automotive engineer from Purdue and an ex-Nash employee. He is able to see through the mass of details that influence Detroit, and gets right to the heart of the matter: "They will not compete in safety. But GM is the real foot dragger. If it were not for GM the rest of the industry would have moved before this." He says further that GM is a large bureaucracy that has no moral values but plenty of leadership. Their values are strictly concerned with profit. The winner in this kind of organization isn't the guy who follows ethics, or "says too much about safety," it's the guy who follows

the goals of the organization (O'Connell, 1966:29).

Irresponsible Priorities. A spokesman for the Insurance Institute, Mr. Kelly, concurs with Henry Wakeland. He says that the reason the manufacturers have been so slow to adopt safety options is their method of setting priorities. "Their priorities put passenger safety in a crash way down at the end of the priorities list." He says it is the nature of the industry because of competition between the closely priced models of each manufacturer. That is, the basic price between Ford, Chevrolet, and Plymouth, for example, is very close. So, if one manufacturer adopts a lot of safety options, the price of his car will inevitably go up. This may knock him out of a good competitive position (Kelly, 1970, WKNO T.V.).

Douglas Toms, the director of the N.H.T.S.A., says that the development of safety in automobiles has been spasmotic and not industry-wide as it should have been. This created one of the major problems in that nobody wanted the competitive advantage (or disadvantage). A good example of this was offered by Mr. Toms in citing the 1956 Ford and its superficial safety program. In that year Ford offered padded dashes and dished steering wheels which earned them the relationship with Chevy: "Chevy sells cars and Ford sells safety." (Business Week, 1971:80).

Of course, the manufacturers claim that their hands are clean by stating that they have always made cars as

safe as they knew how. In order to find out, Consumer Reports purchased a 1969 Chevrolet Suburban (a three seat utility wagon) that is classified as a "Multipurpose passenger vehicle," and is consequently not liable to federal safety standards and laws because it falls in an oddball category. They reported that it does not have to have three of the most important safety devices (according to the law), so Chevrolet does not put them on. Head restraints, shoulder harnesses, and energy absorbing steering columns have been left off the car. "This car is not as safe as GM knew how to make it." Also, they wonder how much safety Detroit would have given the public without the motivation provided by federal safety regulations. (The automobile manufacturers say that the N.H.T.S.A. and its regulations are unnecessary because they give the public what it needs voluntarily.) (Consumer Reports, 1969:182).

More recently the manufacturing executives have been less vocal in their anti-social comments; however, Lee Iococca, current president of Ford Motor Company stated the problem clearly when he was general manager, "Styling cars sells cars and safety does not." Also, William Mitchell, General Motors' one time director of styling, told Fortune Magazine that safe cars would appeal only to "squares--and there ain't any squares no more." (O'Connell, 1966:5).

Profit Margins. Another example of the profit motive in design is stated bluntly: "Why didn't they make the car safe? There are few simple answers in this complicated world, but here is one of them. They simply don't feel there's any money in safety." (O'Connell, 1966:4).

As has been shown, the Congress decided that the automobile manufacturers would not voluntarily give the public what it needs. One reason appears to have been the problem of cost; however, the N.H.T.S.A. as late as 1970 stated that cost must not have been the problem.

> The Bureau has requested information from industry relative to the cost of implementing proposed standards. ... no segment of the industry has yet chosen to provide this information. In view of this lack of response, it must be assumed that actions taken up to this time do not have serious cost or economic implication." (U.S. Dept. of Transportation, 1970:46).

If, then, "serious cost" implications are not involved, what is the expense that Washington is asking Detroit to sustain? U.S. News and World Report feels that the total will be in the neighborhood of $245 for the most recent proposals (U.S. News, 1971:58).

Another estimate was much lower: "Cost estimates vary widely, but it appears that the front-seat system (for an air bag) for 1974 models will add at least $100 to the purchase price of a car." (Business Week, 1971:74).

Many people feel that this added cost will reduce the sales of the car; however, "Detroit has absorbed tremendous increased in labor and materials cost without upping

a car's price tag substantially." Specifically, Mr. Terry of Chrysler has indicated that labors' wages have gone up 60% and that materials have gone up 40% in the last decade, and the price of the car has only gone up 1.5% (Business Week, 1971:81).

Even though safety may cost a small amount the manufacturers are not going to lose anything, as indicated by James Ridgeway of The New Republic: "The automobile manufacturers arrived at the new model price by taking the base price, then adding on the cost of the safety equipment at last years optional prices." He goes on to point out that this keeps the price above what it could be if quantity discounts and uniform production savings were passed on to the public (O'Connell, 1966;220).

Consumer Report is well aware of this policy; however, "Congress, in 1966, replaced Detroit's cost/benefit concept with a more socially relevant one." That is, "that the benefit of safer cars outweighed the cost of making them safer. ...From the point of view of the product planner and his cost accountant, automobile safety components have traditionally suffered a serious defect--that is, an unfavorable cost/benefit ratio. Safety components, they believed, did not sell cars." (Consumers Report, 1969:182).

Obviously, the cost to Detroit is marginal and many critics of automobile design feel that:

> No longer should corporate decisions be measured on the narrow rule of dollar profit, for this rewards the corporation that transfers costs to the motorist. Nor should the industry's actions be

> governed by cost/benefit ratios in which the only measure of benefit is additional sales, rather than another satisfied customer or another saved human life." (Nader, Dodge, Hotchkiss, 1970:138).

The federal government has recently authorized over $3,000,000 for the construction of experimental safety vehicles. In the words of a man who has experienced designing one of these cars for Fairchild Hiller, George Hildebrand, program manager, "I think you can build safer cars for less money, because of improved design." (Motor Trend, 1971:34)

Past Performance--Corvair

The Corvair fiasco is a prime example of how the leader of the industry, General Motors, produced a "mock of excellence" and subjugated safety. They were in fierce competition with the German menace, VW, and consequently had to cut all the corners for cost reduction. They knew to do this was to compromise safety by leaving out such things as stabilizer bars in the Corvair and producing an over-steering car. As early as 1947, Maurice Olley (Chevy's director of research) had written in an article that "... in the case of the over-steering car, the centrifugal force acts as an amplifier of the initial disturbance..." He went on to say as the speed increases the instability increases rapidly and will eventually "become completely unstable." (O'Connell, 1966:179).

Safety Not Desirable. The car buff magazines are

seldom found to give much criticism to GM. Obviously, they rely to a great extent on Detroit for information and advertising with which to fill their magazines, so good public relations is important to them. One notable exception was Car and Driver's report on the Corvair, as reported by Nader:

> Despite a widespread misconception that the old Corvair was 'almost' a sports car, it was one of the nastiest-handling cars ever built. The tail gave little warning that it was about to let go with a vengeance few drivers could cope with (Nader, 1965: 18).

Road Test is a more independent magazine (which does not allow any automobile manufacturers' advertising) and had a more blunt statement,

> Previous to 1965, the car was probably the worst riding, worst all-around handling car available to the American public... Many have been involved in one-car accidents such as the one in which television comedian Ernie Kovacs lost his life (Nader, 1965;18).

Some foreign manufacturers have designs that are similar to the Corvair, but what makes the Corvair so bad is "the sudden onset of the critical point at which the vehicle goes out of control and frequently flips over." Robert Janeway, who has been the director of Chrysler's dynamic research department points out that, "Critical speeds can occur in the normal driving speed range on sharp curves even at moderate degrees of oversteer." (Nader, 1965:32).

According to Ralph Nader, the 60-63 Corvairs reach a

critical point of lateral acceleration (centrifugal force) which is followed by a non-anticipated tuck-under of the rear wheels. This occurs when positive camber shifts dramatically from 4° to 10 or 11°, which will result in extreme skidding, breakaway, and often rollover. The road or vehicle conditions that may cause the above are common place: "tire side skidding, gusts of crosswind, the second leg of an S-shaped curve or a comparable cornering maneuver." At speeds as low as 22 mph and with such ordinary tire inflation as 26#/sq. in., tests have shown that the Corvair will go out of control in just a "fifty degree radius of curvature." (Nader, 1965:33).

As might be expected at this point a racing driver should be at the wheel in order to maintain control of the vehicle. Of course, many cases have been documented in courts throughout the U.S. where the ordinary driver was taken unaware by Corvair's unusual handling characteristics. Many times these accidents may have been said to be caused by reckless driving or failure to maintain proper control, but these have been so many that there can be no doubt that design was the problem. Some even occur when the vehicles are traveling in a straight line at 30 mph on dry pavement and overturn.

The car was advertised by GM as "easy handling," "a family sedan," or a car "that purrs for the girls." Regardless of the advertising (about which Congress has

recently taken Detroit to task), the poor and unsafe design has been noted by Dr. Thomas Manos, an automotive engineering professor at the University of Detroit. He feels the tuck under capacity of the rear wheels to be Corvair's most serious defect. He has stated that he would fail any of his students who presented a design of this sort to him (Nader, 1965:40).

Reasons for Change. As is a matter of public record in many court cases, the 60-63 Corvair has been proven unsafe for normal use. Even though GM was exceedingly slow to change, they finally admitted a need for a change in 1965 after 10,000 people had been killed or injured. The question remains, however, as to the reasons for the slow change (even after hundreds of letters complaining and the prospect of repeated law suits). The reasons for the slow change, according to Ralph Nader, were "bureaucratic rigidities and the abject worship of that bitch-goddess, cost reduction." Nader takes the engineers off the hook further by explaining how corporate pressures deter their professional responsibility for safe design. He describes how poor and unsafe designs can get through an engineering department: "It is to the keepers of those most sacred totems--cost reduction and style--that corporate status and authority accrue." Anyone unfamiliar with how this low-level of design can get through should witness Buick's Edward Ragsdale describing it:

"Cost estimates are given the closest possible scrutiny, and they frequently are calculated to the fourth and fifth decimal place." Ragsdale goes on to say that just a $.02 raise in cost per car may mean $10,000 by the end of the year. "Hence the cost decision has a great bearing upon all proposed changes." (Nader, 1965:22).

This emphasis on cost overiding safety was even admitted at a meeting of the Society of Automobile Engineers by Charles Ruby, a Chevrolet engineer in answer to the question of why they left the stabilizer bar off:

> First, we felt the slight amount of gain realized did not warrant the cost; secondly, we did not wish to pay the penalty of increased road noise and harshness that results from use of a stabilizer.

Further he explained why they chose the unsafe rear axle: "Our selection of this particular type of a swing-axle rear suspension is based on: (1) lower cost, (2) ease of assembly, (3) ease of service, and (4) simplicity of design." (Nader, 1965:36).

Harry M. Philo, a Detroit lawyer who has dealt with the Corvair problem days that GM knew the Corvair's rear suspension design was dangerous. "However, they found the Corvair was not competitive (costwise) with the Falcon and Valiant... and it would cost still more to put in a correct suspension." (O'Connell, 1966:179).

A Chicago attorney and legislator, Harold Katz, concluded a law journal, "Negligence in Design" with the statement that passing financial liability back to the

manufacturer for poor design may cause them to take "social responsibility where the pleas of physicians and other concerned citizens on humanitarian grounds have so adjectly failed." In history a great persuader of the socially irresponsible has been the damage suit. He feels it will be effective in motivating Detroit to more responsible action (O'Connell, 1966:187).

Ultimate proof that the Corvair was not right was dramatically confirmed when they had to halt production on them and Consumers Union is still trying to get the remaining Corvairs recalled for safety modifications.

Projected Solutions---Passive Restraints

An example of how Detroit in its own words is "dragging its feet" is the slow rate of development of life-saving passive restraints. The most developed restraint is the air bag which is a device that expands like a large plastic bag in front of the passengers in the event of an accident. The manufacturers agree that benefits outweigh the bad points and that the air bag would "save more people than they'll kill or cripple." However, Detroit still refuses to put the bags on their cars, for they say they need more time for development (Popular Mechanics, 1971:166).

Safety Not Desired. One man who recently attended a demonstration by General Motors of the air bag was Patrick J. Sloyan. He gives some insight into the reason for Deeroi

troit's snail pace concerning the installation of the bag: GM and other manufacturers want to sell the bag "if at all" in such a way that production schedules and style changes are not upset to any great degree. So GM, by changing gradually one-third of its models per year, would like to wait until 1976 to install these items (New Republic, 1971:5).

Of course, Detroit's reasons for not pursuing rapid development of the air bag are known for certain only by the upper level management; however, it may be for some of the general reasons already mentioned, since this is an item which is not essential to sales.

The level of development of reliability which Detroit is demanding for this item is very interesting. They have repeatedly asked the N.H.T.S.A. for extensions of deadlines which require the installation of the air bag to their automobiles. This follows their normal response pattern to safety requirements (as in the case of seat belts and shoulder harnesses). The present state of development is said by David Campbell, assistant chief engineer for Fisher Body, to be "five nines for reliability." This directly contradicts other public statements made by GM, but Campbell's statement was made in private. By the five nines he means that 99.999 percent of the time the bag will deploy correctly at the right time in an impact only. He went on to say that the danger to the ear could easily be muffled "below levels dangerous to the ear." It seems that

in the press conference earlier the same day Mr. Campbell had stated the industry's point of view that there were still "unresolved questions regarding system reliability and the manufacturer's possible liability." (New Republic, 1971:5).

Reasons for Change. The excuse of noise is often claimed by Detroit, but some "designs do in fact minimize the noise." By their own admission and design they can conquer the technical problems related to development of the air bag (Changing Times, 1970:32).

"Both GM and Ford did work on a system like this on or about 1958, but dropped the inquiry" and will not assist others to develop it (Nader, 1965:58). As if thirteen years is not sufficient itme, they still continue to say that their development of the air bag is insufficient and unreliable. A relatively small firm, Eaton, Yale, and Towne, has developed one just since 1965. They only spent $5,000,000 on their development (which certainly makes Detroit look unmotivated toward safety or grossly inefficient in their efforts). Eaton has even run tests on their device conducted by Dr. Charles Nixon, the impulse noise expert at Wright Air Craft. Eighty four tests were run using 91 human subjects and found no problem with the noise factor, the reliability nor the cushioning capacity (Popular Mechanics, 1971:170). They have racked up over 2 million miles of tests, and they "haven't experienced a single

accidental triggering." Even if the device were deployed accidently, it would not impede safety significantly, since it expands and contracts so rapidly (40 milliseconds for expansion). The U.S. Air Force has even tested the item at Holloman A. F. Base using 40 human subjects. They must have been pretty sure of success before they started because of possible liability. There were no failures or injuries and,

> Doubts as to the safety, reliability, and feasibility of the air bags are virtually resolved. There are no grounds for Detroit to delay. Each year 55,000 lives are at stake (New Republic, 1971:6).

This brings up the last point made by David Campbell in speaking for the industry of the industry's "possible liability" for malfunctions of the air pillows (New Republic, 1971:6). This is the same comment made by a safety engineer for one of the big three. "But all the research in the world isn't going to get us off the hook if we become embroiled in lawsuits." (Popular Mechanics, 1971:170).

None the less, the fact that Detroit has been forced to include greater safety in their designs in the recent past, has been reflected in the reduction of the death rate/100 million miles driven (as seen in Table 1). This has not been a result of fewer cars on the highways (Table 2).

In all fairness to Detroit, it must be admitted that to require them to install the air bags unwillingly and then hold them legally responsible for their proper func-

tioning is somewhat harsh. However, they have "5 nines of reliability" and should have had all the bugs out in over a decade of development if they were really concerned. Instead, they have recently postponed the pending federal regulation requiring a passive restraint from 1974 to 1976.

SUMMARY

The foregoing should lay to rest the idea that Detroit will voluntarily develop a safe car (regardless of what they may say). But why are they opposed to an idea which seems intrinsically good:

1. Their method of setting priorities, in which case styling and/or planned obsolescence usually take precedence.
2. The competition among the manufacturers. Generally they do not feel they should add on safety options if they can get away without them, as seen in the Consumer Reports observation of the 1969 Chevrolet Suburban.
3. Additional capital outlay for safety features was judged to be unnecessary to sales.
4. The most important reason, in the words of the head of the N.H.T.S.A., Douglas Toms, is that it is not profitable.

Of the three elements that are given by most experts in the field for accidents, the car, the driver, and the

road, the only one which has changed much since 1966 is the automobile. This was the year of the Federal Safety Act and can be seen in the decline of the death rate per 100 million vehicle miles.

CONCLUSION

The most significant development in the design of the automobile has occurred within the past decade. This action occurred when the carnage on our roads reached the intolerable level, and the public became aware of this (largely a result of Ralph Nader's book in 1965).

As is classic in American history, the result was that a public institution had to take the responsibility which Detroit would not for designing a safe automobile. As with most consumer goods in a competitive society, cost is a factor in the eventual sale of the product; however, it is not as critical a problem as Detroit would have us believe in determining the safety level. Their failure to produce adequate safe car design is echoed by their public relations department, as the answer to the researcher's queries concerning their safety programs were so feeble.

This attitude on Detroit's part is slowly changing (as a result of government pressure), but this slow change will hardly help reduce the 55,000+ yearly death toll in the U.S. quickly enough. Possibly when the experimental

safety vehicle is delivered to the government in December of 1971, it will show the way towards a safe type of individual transportation which Detroit has not. Not withstanding the cost of these programs, the slight amount of progress that has been made should not allow the American people to feel that enough has been done in this area.

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TABLE 1

MOTOR VEHICLE DEATHS: NUMBER AND PERCENT CHANGE, 1961-1969

YEAR	DEATHS	ANNUAL PERCENT CHANGE	AVERAGE ANNUAL PERCENT CHANGE	DEATHS PER 100 MILLION VEHICLE MILES
1961	38,091	-0.1		5.16
1962	40,804	7.1		5.32
1963	43,564	6.8		5.41
1964	47,700	9.5	6.8	5.63
1965	49,163	3.1		5.54
1966	53,041	7.9		5.70
1967	52,924	-0.2	2.1	5.50
1968*	55,200	4.3		5.43
1969**	56,400	2.2		5.32

* PRELIMINARY

** ESTIMATED

SOURCE: Deaths: 1961-1967, National Center for Health Statistics, Department of Health, Education, and Welfare. 1968-1969 National Safety Council.

TABLE 2

GROWTH IN MOTOR VEHICLES AND POPULATION

	1958	1968	ANNUAL PERCENT INCREASE 1958-1968	1969*	PERCENT INCREASE 1968-69
TOTAL REGISTERED MOTOR VEHICLES	68,818,000	103,145,000	+4.13	106,957,000	+3.70
Automobiles	56,891,000	83,693,000	+3.94	86,560,000	+3.43
Trucks	11,136,000	16,999,000	+4.32	17,781,000	+4.60
Buses	270,000	352,000	+2.69	361,000	+2.56
Motorcycles, Motorscooters, etc.	521,000	2,101,000	+14.96	2,255,000	+7.33
U.S. RESIDENT POPULATION, JULY 1	174,149,000	199,846,000	+1.39	201,921,000	+1.04
REGISTERED MOTOR VEHICLES PER CAPITA	0.40	0.52	+2.65	0.53	+1.92

*ESTIMATED ON THE BASIS OF STATE REGISTRATION REPORTS AND ON CURRENT TRENDS, VEHICLE PRODUCTION, AND OTHER FACTORS MADE BY BUREAU OF PUBLIC ROADS IN THE EARLY MONTHS OF 1969

SOURCES: Bureau of Public Roads.
U.S. Bureau of the Census

APPENDIX A

SAMPLE OF LETTER SENT TO FORD MOTOR CO., GENERAL MOTORS, CHRYSLER CORPORATION AND AMERICAN MOTOR COMPANY

2335 Riley
Memphis, Tenn. 38114
March 8, 1971

Ford Motor Company
Public Relations Department
American Road
Dearborn, Michigan

Dear sirs:

In working on my Masters degree at Memphis State University, I am writing a research paper on "Automobile Safety." Information on any contributions your firm has made or is making to the field of automobile safety would be of great help in writing my paper.

Two areas of special interest in this study are: (1) safety concerning the "second collision" between man and car, and (2) the dates that your safety devices were first available as options and when they were made standard equipment.

Anything which you can furnish will be greatly appreciated.

Sincerely,

George James King

APPENDIX B

SAMPLE OF LETTER SENT TO CONSUMER REPORTS, FEDERAL GOVERNMENT (AUTO SAFETY), ALLSTATE INSURANCE COMPANY, AND INSURANCE INSTITUTE OF AMERICA

2335 Riley
Memphis, Tenn. 38114
April 1, 1971

Safety Director
Allstate Insurance Company
Northbrook, Illinois 60062

Dear sir:

I was very pleased to learn recently that you are conducting research on automobile crashworthiness. Since I am writing a research report on this subject, I would be very interested and grateful for any comments you might offer as to why Detroit has not done more in this area.

If you would like a copy of my report, please indicate this in your response. Thank you very much.

Sincerely,

George James King